Expert Tips

How to Use Environmental Product Declarations

Addresses the limitations of using EPDs alone to determine the environmental impacts of construction products

I'm planning to use EPDs to select products with the lowest environmental impact. What are the limitations to this approach?

Environmental Product Declarations (EPDs) report the environmental impacts of construction products, including wood products. They have gained popularity among building designers as a simple tool to influence material selection. However, product selection based on EPDs alone doesn't provide a wholistic view of the system and doesn't necessarily result in maximum embodied carbon reductions for a project.

This is best explained using a simple example like choosing wallpaper for your house. You can look at all possible wallpapers and find the specific product that has the lowest environmental impact based on an EPD. That's great… if you are committed to using wallpaper. But you may have missed an alternative type of product—like paint. This is where material selection on the basis of EPDs is limiting. You might be able to choose the best product *within a certain material category* (or maybe not—more on that later), but you haven't necessarily picked the best product *overall*. This is why a wholistic approach is needed; by considering options across all relevant product categories, you can make the best system choice.[1]

For building systems, taking a wholistic approach means conducting a whole building life cycle assessment (WBLCA) of structural members at the design phase. This will often mean choosing mass timber over a more traditional building material like steel or concrete, resulting in more significant embodied carbon reductions, rather than simply choosing the lowest embodied carbon product among available steel or concrete options.

Okay, so I need to consider products across a range of product categories. In that case, I'll compare EPDs for paint with EPDs for wallpaper to make my selection.

There are problems with this approach, too. EPDs are governed by product category rules, or PCRs. This is a set of rules agreed upon by a wide range of stakeholders, developed in accordance with international standards, and independently reviewed by a third party. The PCR precisely defines the products to which the rules apply, inclusions and exclusions from the scope of the life cycle assessment (LCA) used to create the EPD, the methodological approach for performing the assessment, and the results that must be reported. This means it may not be appropriate to make direct comparisons between EPDs for products in different product categories and/or developed under different PCRs (i.e., results in an "apples-to-oranges" comparison).

Even under a single PCR, the rules and/or background reference data may change over time. This is why EPDs must be dated and revalidated every few years. To ensure an accurate "apples-to-apples" comparison, EPDs should be based on the same PCR and be current.

A note about North American vs. European wood products:

In addition to the limitations noted above, it is important to note global variations in PCRs. An example is the PCR for North American wood products[2] vs. the PCR that governs European wood products.[3] The North American PCR does not allow a net negative global warming potential (GWP) to be reported in a cradle-to-gate EPD. This is based on the conservative assumption that all of the biogenic carbon stored in the wood product is eventually released back to the atmosphere.[4] The European PCR, however, does allow a net negative GWP to be reported in a cradle-to-gate EPD. If directly comparing North American to European wood products, European EPDs will report a lower cradle-to-gate GWP, even though their actual environmental performance may be similar.

If it's true that EPDs based on different PCRs can't be compared to each other, how can we make comparisons between different materials or different types of products?

This is where *whole life* LCAs (also known as *cradle-to-grave* LCAs) come into play. EPDs are based on product-level LCAs, which are typically *cradle-to-gate* only. That is, they capture only a *portion* of the life cycle from raw material extraction through the end of product manufacturing (also called the *Production Stage* of the life cycle which includes Modules A1-A3). However, commercially available LCA tools[5] include *all* stages of the life cycle, starting with the *Production Stage* mentioned above, continuing with the *Construction Stage* (Modules A4-A5) and *Use Stage* (Modules B1-B7) and ending with the *End-of-Life Stage* (Modules C1-C4).[6]

When product data from an EPD is incorporated into an LCA tool, there is a significant amount of effort required for *data harmonization*. This means the tool developers must look at all of the background data that was used to create the EPD and make adjustments to ensure that, across a broad range of product types, consistent data is being used. As a simple example, there are many different sources of data for the environmental impacts of diesel-powered trucks that transport raw materials from the extraction site to the manufacturer. One EPD might be based on one set of data while another EPD might be based on a different set of data. One of the tool developers' tasks is to "harmonize" this discrepancy to ensure the two data points are comparable. This behind-the-scenes work is what makes it possible to accurately compare different products and systems within these tools, whereas simply comparing EPD data outside the tools may not be appropriate. It also allows the tool developers to apply consistent data to the life cycle stages that are excluded from EPDs.

Another benefit to using a cradle-to-grave LCA is the ability to capture the additional impacts of a product beyond the manufacturing gate. Let's go back to our wallpaper example. Say wallpaper A has a higher GWP reported in its EPD but is available at the store down the street. Alternatively, the EPD for wallpaper B reports a lower GWP but is only available at a store many hours away by car. Based on EPDs alone, wallpaper B wins, but considering the transportation impacts of getting the product to your house, it may not be the least impactful choice overall. EPDs don't capture those transportation impacts from the manufacturer to its end use location (Module A4), but cradle-to-grave LCAs do.

Similar considerations arise when looking at building systems. Comparing one mass timber system to another, differences between manufacturers are likely to be minimal—though transportation impacts will increase with distance from the jobsite. However, comparing mass timber to other building systems, there are likely to be significant differences at multiple life cycle stages. For example, shorter construction schedules and lighter material weights associated with mass timber reduce construction impacts, while the use of exposed timber reduces the need for finish materials. These benefits might not be apparent when comparing EPDs, but are accounted for in the results of a WBLCA.

Understanding their limitations, when <u>can</u> I use EPDs? Why are they important, if not for comparing products?

EPDs, and the LCAs on which they are based, provide valuable data to the building industry, and are used in several ways. First, as mentioned, they provide the basis for many of the products available in LCA tools, which are in turn used for wholistic building system comparisons such as WBLCA. Second, they provide transparent information about material extraction and manufacturing practices and can be used to identify potential

areas for improvement. For manufacturers, this is a way of participating in the green building economy by voluntarily quantifying and publicly reporting the environmental benefits and impacts of their products.

The collection and direct comparison of EPDs is most appropriate in the procurement phase of design and construction once it is known that a certain product type will be used (e.g., concrete for spread footings). At that point, the designer or contractor can compare EPDs for all available products that meet the project specifications to select the product with the lowest environmental impact. EC3 is one such tool that was specifically developed to compare EPDs during the procurement phase to assist with final product selection. EC3 is not an LCA tool, however, and should not be used for the comparison of different building systems. EPDs are also an exceptional tool for validating the data produced in the WBLCA to ensure the embodied carbon savings that were anticipated in design are, in fact, proving out during construction.

EPDs are an important tool in moving toward a lower embodied carbon future. However, it's important for designers to understand how to use EPDs appropriately and the limitations of direct EPD comparison. By using the data provided in EPDs, combined with a cradle-to-grave WBLCA approach, designers can have the greatest effect on the embodied carbon footprint of the built environment.

Additional Resources:

American Wood Council. *Sustainability: EPDs & Transparency Briefs.*

Bowyer, J., Howe, J., Fernholz, K., Bratkovich, S., & Stai, S. (2011). *Environmental Product Declarations (EPDs) Are Coming: Is Your Business Ready?*

Jamison, Rachael. American Wood Council. *Decarbonizing the Built Environment: Getting it Right!*

Trusty, W. (2012). *Environmental Product Declarations: What? Why? How?*

[1] This is a purely hypothetical example and is not intended to make claims about the relative environmental impacts of wallpaper versus paint.

[2] Part B: Structural and Architectural Wood Products EPD Requirements

[3] Wood and Wood-Based Products for Use in Construction (EN 16485:2014)

[4] Read more about biogenic carbon accounting over the life cycle here.

[5] Commonly used LCA tools in North America include Athena Impact Estimator, Tally and OneClick LCA.

[6] Read more about the life cycle stages here.